



JC10 Rec'd PCT/FR 03 JUN 2005

PCT

Atty. Dkt. No. 355901-7300

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Alexia BALLAND-LONGEAU et al.

Title: POLYPHENYLENE-TYPE  
POLYMERS, PREPARATION  
METHOD THEREOF,  
MEMBRANES AND FUEL CELL  
DEVICE COMPRISING SAID  
MEMBRANES

Appl. No.: 10/523,642

InterNtl. 8/4/2003

Filing Date:

Examiner: Not Yet Assigned

Art Unit: Not Yet Assigned

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TRANSMITTAL

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Sir:

Transmitted herewith is the following document for filing in the above-identified application.

1. English translation of International Preliminary Examination Report of PCT/FR2003/002455 (5 pgs.);
2. Corrected first page of WO 2004/014981 republished on March 31, 2005, including the name and address of inventor Philippe CAPRON; and
3. Return postcard.

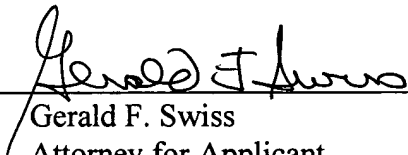
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Please direct all correspondence to the undersigned attorney or agent at the address indicated below.

Respectfully submitted,

Date 6-1-05

FOLEY & LARDNER LLP  
Customer Number: 38706  
Telephone: (650) 251-1103  
Facsimile: (650) 856-3710

By   
Gerald F. Swiss  
Attorney for Applicant  
Registration No. 30,113

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Date d'expédition (jour/mois/année) 28 avril 2005 (28.04.2005)	
Référence du dossier du déposant ou du mandataire B 14132.3 FG	NOTIFICATION IMPORTANTE
Demande internationale n° PCT/FR2003/002455	Date du dépôt international (jour/mois/année) 04 août 2003 (04.08.2003)
Déposant COMMISSARIAT A L'ENERGIE ATOMIQUE etc	

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Fonctionnaire autorisé

Athina Nickitas-Etienne

n° de télécopieur+41 22 740 14 35

n° de télécopieur+41 22 338 89 95

Translation

PATENT COOPERATION TREATY



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INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference B 14132.3 FG		<b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/FR2003/002455	International filing date (day/month/year) 04 août 2003 (04.08.2003)	Priority date (day/month/year) 06 août 2002 (06.08.2002)	
International Patent Classification (IPC) or national classification and IPC C08G 61/10			
Applicant COMMISSARIAT A L'ENERGIE ATOMIQUE et al.			

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 5 sheets, including this cover sheet.

☐ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of \_\_\_\_\_ sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand 13 février 2004 (13.02.2004)	Date of completion of this report 22 November 2004 (22.11.2004)
Name and mailing address of the IPEA/EP	Authorized officer
Facsimile No.	Telephone No.

## I. Basis of the report

## 1. With regard to the elements of the international application:\*

- ☒ the international application as originally filed
- ☒ the description:  
pages \_\_\_\_\_ 1-35 \_\_\_\_\_, as originally filed  
pages \_\_\_\_\_, filed with the demand  
pages \_\_\_\_\_, filed with the letter of \_\_\_\_\_
- ☒ the claims:  
pages \_\_\_\_\_ 1-13 \_\_\_\_\_, as originally filed  
pages \_\_\_\_\_, as amended (together with any statement under Article 19  
pages \_\_\_\_\_, filed with the demand  
pages \_\_\_\_\_, filed with the letter of \_\_\_\_\_
- ☐ the drawings:  
pages \_\_\_\_\_, as originally filed  
pages \_\_\_\_\_, filed with the demand  
pages \_\_\_\_\_, filed with the letter of \_\_\_\_\_
- ☐ the sequence listing part of the description:  
pages \_\_\_\_\_, as originally filed  
pages \_\_\_\_\_, filed with the demand  
pages \_\_\_\_\_, filed with the letter of \_\_\_\_\_

## 2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language \_\_\_\_\_ which is:

- ☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of the translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

## 3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages \_\_\_\_\_
- ☐ the claims, Nos. \_\_\_\_\_
- ☐ the drawings, sheets/fig \_\_\_\_\_

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).\*\*

\* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rule 70.16 and 70.17).

\*\* Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.

## V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

## 1. Statement

Novelty (N)	Claims	1-13	YES
	Claims		NO
Inventive step (IS)	Claims	1-13	YES
	Claims		NO
Industrial applicability (IA)	Claims	1-13	YES
	Claims		NO

## 2. Citations and explanations

**Novelty**

D1 (WO9628491) describes poly-p-phenylene copolymers including perfluoroalkyl substituents. D1 does not describe a copolymer containing at least one group selected from among  $-\text{SO}_3\text{H}$ ,  $-\text{PO}_3\text{H}_2$ ,  $-\text{CO}_2\text{H}$  or perfluoroalkyl/aryl substituted by at least one  $-\text{SO}_3\text{H}$ ,  $-\text{PO}_3\text{H}_2$ ,  $-\text{CO}_2\text{H}$  group.

D2 (XP2241914) describes a method for sulphonating poly-p-phenylene polymers. D2 does not describe a copolymer containing both units (I) and (II) of claim 1 of the application.

D3 (DE19535086) describes the preparation of copolyphenylenes that do not include unit (I) as per claim 1 of the application.

D4 (US5403675) describes sulphonatable polyphenylene polymers (column 9, lines 5 to 25). D4 does not explicitly describe a polymer containing both units (I) and (II) of claim 1 of the application.

D5 (WO9855534) describes electrolytic polymers

functionalised by sulphonic acid groups. D5 does not describe polyphenylene copolymers as per claim 1 of the application.

The subject matter of claims 1 (polymer), 11 (method), 12, 13 and dependent claims 2 to 10 is novel over D1 to D5.

#### **Inventive step**

D1, D3 and D4 describe methods for preparing polyphenylenes having sulphonic groups inserted by post-sulphonation.

The application proposes an alternative method for inserting ionic groups into polyphenylenes. Furthermore, said method enables certain other ionic groups to be inserted (carboxylic, phosphoric, perfluorosulphonic), the concentration of the ionic groups in the polymer to be more accurately controlled, and hence the ion exchange capacity of the copolymer to be better regulated.

The technical problem addressed by the application can be considered to be that of preparing electrolytic copolymers having a more readily controlled ion-exchange capacity.

This problem is solved by the coupling method set forth in claim 11 of the application.

The prior art documents describe the post-sulphonation method. None of the prior art documents describes the claimed coupling.

The subject matter of claim 11 is inventive relative to D1 to D5.

The subject matter of claims 1 to 10 (product) and 12, 13 is consequently inventive relative to D1 to D5.

VERSION CORRIGÉE

(19) Organisation Mondiale de la Propriété  
Intellectuelle  
Bureau international



(43) Date de la publication internationale  
19 février 2004 (19.02.2004)

PCT

(10) Numéro de publication internationale  
WO 2004/014981 A3

(51) Classification internationale des brevets<sup>7</sup> :  
C08G 61/10

(21) Numéro de la demande internationale :  
PCT/FR2003/002455

(22) Date de dépôt international : 4 août 2003 (04.08.2003)

(25) Langue de dépôt : français

(26) Langue de publication : français

(30) Données relatives à la priorité :  
02/10008 6 août 2002 (06.08.2002) FR

(71) Déposant (pour tous les États désignés sauf US) : COM-  
MISSARIAT A L'ÉNERGIE ATOMIQUE [FR/FR];  
31-33, rue de la Fédération, F-75752 Paris 15ème (FR).

(72) Inventeurs; et

(75) Inventeurs/Déposants (pour US seulement) : BAL-  
LAND-LONGEAU, Alexia [FR/FR]; 152, rue de  
Boisdenier, F-37000 Tours (FR). PEREIRA, Franck  
[FR/FR]; 3 rue Jean-Sébastien Bach, F-38200 Luzinay  
(FR). CAPRON, Philippe [FR/FR]; Le Village, F-38200  
Luzinay (FR). MERCIER, Régis [FR/FR]; 17, avenue  
Joannes-Gazagne, F-69540 Irigny (FR).

(74) Mandataire : GUERRE, Fabien; c/o Brevatone, 3, rue du  
Docteur Lancereaux, F-75008 Paris (FR).

(81) États désignés (national) : AE, AG, AL, AM, AT, AU, AZ,  
BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ,

DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM,  
HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK,  
LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX,  
MZ, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD,  
SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG,  
US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) États désignés (régional) : brevet ARIPO (GH, GM, KE,  
LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), brevet  
eurasien (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), brevet  
européen (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI,  
FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK,  
TR), brevet OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ,  
GW, ML, MR, NE, SN, TD, TG).

Publiée :

— avec rapport de recherche internationale

(88) Date de publication du rapport de recherche  
internationale: 8 avril 2004

(48) Date de publication de la présente version corrigée:  
31 mars 2005

(15) Renseignements relatifs à la correction:  
voir la Gazette du PCT n° 13/2005 du 31 mars 2005, Sec-  
tion II

En ce qui concerne les codes à deux lettres et autres abrégia-  
tions, se référer aux "Notes explicatives relatives aux codes et  
abréviations" figurant au début de chaque numéro ordinaire de  
la Gazette du PCT.

(54) Title: POLYPHENYLENE-TYPE POLYMERS, PREPARATION METHOD THEREOF, MEMBRANES AND FUEL CELL  
DEVICE COMPRISING SAID MEMBRANES

(54) Titre : POLYMERES DE TYPE POLYPHENYLENES, LEUR PROCÉDE DE PREPARATION, MEMBRANES ET DISPO-  
SITIF DE PILE A COMBUSTIBLE COMPRENANT CES MEMBRANES

(57) Abstract: The invention relates to polymers comprising phenylene units at least one of which bears laterally a phenylene group  
which is substituted by a group or a perfluorinated chain which itself bears a -SO<sub>3</sub>H, -PO<sub>3</sub>H<sub>2</sub> or -CO<sub>2</sub>H group. The invention also  
relates to the use of said polymer in forming fuel cell membranes.

(57) Abrégé : La présente invention a pour objet des polymères comprenant des motifs phénylène dont l'un au moins est porteur  
latéralement d'un groupe phénylène substitué par un groupe, ou une chaine perfluorée, porteur elle-même d'un groupe -SO<sub>3</sub>H, -PO<sub>3</sub>H<sub>2</sub>  
ou -CO<sub>2</sub>H. Utilisation de ce polymère pour constituer des membranes de pile à combustible.

WO 2004/014981 A3